Repeatability and Accuracy of Carboxyhemoglobin Measurement by Pulse CO-Oximetry in Children.

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Introduction

Carboxyhemoglobin (COHb) can be measured noninvasively (SpCO) using a pulse CO-oximeter (Radical7 Rainbow SET, Masimo, Irvine CA). This device has acceptable accuracy in adults (1). The purpose of this study was to test the repeatability and accuracy of this device in children.

Methods

After IRB approval and parental consent, 166 children aged 2-16 years having outpatient surgical procedures were enrolled. An appropriately sized non-disposable finger sensor was applied 3 times in succession for measurement of preoperative SpCO. The agreement of these measurements was assessed by Bland-Altman plot and intra-class correlation (ICC) estimation to determine the repeatability of the device. Following induction of anesthesia, SpCO was measured again while a blood sample was obtained for laboratory measurement of blood COHb by co-oximetry. Bland-Altman and linear regression analyses were used to assess the accuracy of SpCO compared to the reference, blood COHb.

Results

Repeatability coefficient for SpCO measurements was 5.4% (Fig 1). The ICC was 0.760 (95% CI 0.712-0.842). Accuracy results for SpCO vs COHb: Bland-Altman bias 4.71 (Fig 2); Spearman correlation coefficient -0.23 (Fig 3).

Conclusions

Although the ICC was acceptable, the repeatability coefficient of the Masimo SpCO device is moderately high for the expected values of CO in this population and setting. When compared to blood COHb by co-oximetry, the device's SpCO measurements are of unacceptable accuracy and correlation in children.

References: (1) Barker SJ et al. Measurement of Carboxyhemoglobin and Methemoglobin by Pulse Oximetry. Anesthesiology 2006;105:892-7.

Fig 2 Bland-Altman SpCO vs COHb

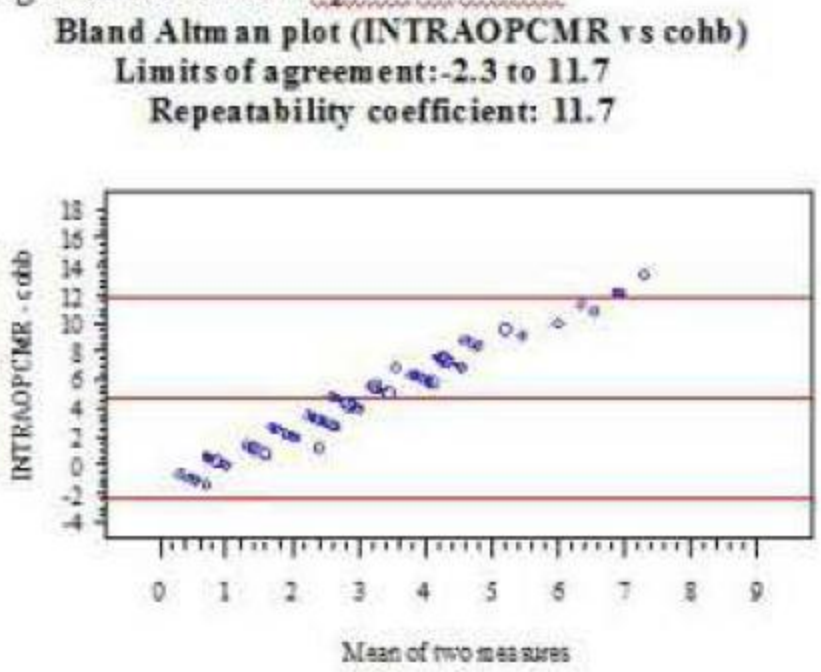

Fig 3 Linear regression COHb vs SpCO